

RETRACTABLE AND DEPLOYABLE PANEL

Inventor:
Peter C. Anderson

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/431,396, filed December 6, 2002. In addition, this application is a continuation-in-part of U.S. Application No. 10/166,346, filed November 26, 2001, which in turn was a continuation-in-part of U.S. Application No. 09/692,484 filed October 19, 2000, now issued as US Patent No. 6,446,564, which claimed the benefit of U.S. Provisional Applications No. 60/171,123, filed December 16, 1999 and No. 60/221,743 filed July 31, 2000. Each of these applications is herein incorporated in its entirety by reference.

FIELD OF THE INVENTION

[0002] The invention relates to furniture having convertible or stowable working surfaces. More particularly this invention relates to dual use desks, tables, consoles, credenzas or workstations wherein a working surface or bearing surface that may be retracted to allow access to a lower surface or compartment.

BACKGROUND OF THE INVENTION

[0003] The conventional office desk pre-dates the personal computer. The most readily usable region of the desktop that is most important is that directly in front of the seated user, immediately accessible with hands and eyes without a stretch or a head movement, for such activities a reading, writing, or typing.

[0004] When personal computers were first introduced, users simply placed them on their existing desks; the monitor on the back edge of the desk, the keyboard in front of the monitor. Many new computer users still try this first. However, it soon becomes evident that a conventional desk has serious disadvantages in a dual use in that the usual placement of the keyboard precludes the primary or alternative use of the desktop as a writing or working surface. Further, the keyboard, setting on the desktop is generally not at a comfortable height for typing.

[0005] Many attempts have been made to overcome these basic problems. Most of these designs can be loosely categorized into two general forms; dedicated computer desks, and dual-purpose desks. An example of a dedicated computer desk design is a desk with an open section in the front edge of the desktop into which a keyboard shelf has been attached, typically a few inches below the level of the desktop. This design puts the keyboard at a comfortable height but does not provide a writing surface.

[0006] An example of a dual use desk is one modified to provide a pullout tray from under the desktop for a keyboard, which can be stowed below the desktop level when not in use. This leaves the desktop free for other purposes, but requires the user to push back his chair and sit at an inconvenient distance from the desk and computer monitor. Another example provides an opening in the desktop which allows the keyboard to be located on a shelf below the desktop, and which can be covered by a hinged lid when the keyboard is not in use. The lid occupies space elsewhere on the desktop when hinged away from the opening, and may even obscure the viewing screen of the computer monitor.

[0007] Other examples of dual use desks provide openings in the desktop covered by lids that can be lowered and pushed along multiple branched

tracks below the desktop. These require the manufacture of complex, multiple and/or branched tracks specifically designed to allow the lid to be moved from the lower to the higher track, for example. They may also require springs to raise the lids and special pins to engage the tracks. There are also designs with openings in the desktop covered by lids that can be lowered or raised by geared mechanisms. These also are an expensive and cumbersome solution.

[0008] There are many desk designs that provide facilities for housing computer equipment, including monitors, below the level of the desktop. These keep the desktop generally free for other uses and may allow viewing of a screen at a low angle.

[0009] In summary, prime desktop space and all usable space within arms reach of the seated user being at a premium, it is desirable to optimize the utility and efficiency of the space available in a person's desk. Computers and keyboards now being essential to many user's daily activities, the desk must function as a computer workstation, and in combination or alternatively as a conventional desktop for other activities. As is noted, the problem has been addressed many times in many ways with varying degrees of success.

[0010] In homes, businesses and offices, there are various places where multiuse workstations may be highly desirable: kitchens, home offices, craft rooms, copier rooms, kiosks. In many areas retractable and deployable panels would be highly desirable, including, but not limited to desktops, kiosks, work stations, work benches, plane or boat bulkheads, floors, library tables, conference tables, credenzas, dressing tables, vanities, commodes, benches, seats of chairs, chests, secretaries, occasional tables, kitchen counters, hatches, floors, roads, sidewalks, pavement, and lawns.

[0011] What is needed, therefore, is a simpler design for retractable and deployable panel; a design that is easily and quickly re-configurable by the user, between a plurality of configurations. It is this need to which the instant invention is directed.

BRIEF SUMMARY OF THE INVENTION

[0012] One embodiment of the present invention provides a system for the retraction and deployment of a panel, that system comprising: a first planar surface beneath which is disposed a support structure; a panel; and an opening disposed in the first planar section which is configured to receive the panel into a closed position disposed in the opening and substantially co-planar with the first planar surface. Also provided is at least one slider assembly, comprising a stationary component and a sliding component, the stationary component coupled to the support structure and disposed at a sloping angle, the sliding component coupled to the panel at a hinge point such that the panel is rotatable between a co-planar closed position angle and the sloping angle, and when the sliding component is fully extended is slidable on the slider assembly at the sloping angle to a stowed position. According to this embodiment the panel is movable between the stowed position wherein the panel is pitched at a stowed position angle equal to the sloping angle and the closed position by lifting the panel from either position, rotating the panel to match the angle of the other position, and lowering the panel into the other position.

[0013] Another embodiment of the present invention provides such a system further comprising at least one panel edge support disposed beneath the first planar surface, such that when the panel is in the closed position, the panel is supported by the panel edge support.

[0014] A further embodiment of the present invention provides such a system wherein the panel edge support is a lip disposed around the edge of the opening.

[0015] Still another embodiment of the present invention provides such a system wherein at least one panel edge support consists of a plurality of panel edge supports.

[0016] A still further embodiment of the present invention provides such a system wherein at least one panel edge support comprises first and second oppositely disposed panel edge supports separated by first and second gaps disposed proximate to the hinge point.

[0017] Yet another embodiment of the present invention provides such a system wherein the opening is a geometric shape chosen from the group of geometric shapes consisting of squares, oblongs, triangles, ovals, and circles.

[0018] A yet further embodiment of the present invention provides such a system wherein the opening is bounded by the first planar surface on three sides.

[0019] Even another embodiment of the present invention provides such a system wherein the front edge of the panel and the front edge of the opening have mating profiles.

[0020] An even further embodiment of the present invention provides such a system wherein the mating profiles are at an angle equal to the sloping angle.

[0021] Another embodiment of the present invention provides such a system further comprising a support member to which one central slider assembly is attached, the support member being attached at a sloping angle to the support structure.

[0022] A further embodiment of the present invention provides such a system wherein a first end of the stationary component is pivotally attached to the support structure, a second end of the stationary component bearing on at least one adjustable support attached to the support structure, the adjustable support having means for adjusting the sloping angle of the stationary components.

[0023] Still another embodiment of the present invention provides such a system wherein the first planar surface comprises a planar surface selected from the group of planar surfaces consisting of desktops, kiosks, work stations, work benches, plane or boat bulkheads, floors, library tables, conference tables, credenzas, dressing tables, vanities, commodes, benches, seats of chairs, chests, secretaries, occasional tables, kitchen counters, hatches, floors, roads, sidewalks, pavement, and lawns.

[0024] A still further embodiment of the present invention provides such a system further comprising a second planar surface parallel to the first planar surface and disposed beneath the panel.

[0025] Yet another embodiment of the present invention provides such a system wherein the second planar surface is stationary.

[0026] A yet further embodiment of the present invention provides such a system wherein the second planar surface is slidable.

[0027] Another embodiment of the present invention provides such a system further comprising a second planar surface parallel to the first planar surface and disposed beneath the opening.

[0028] A further embodiment of the present invention provides such a system wherein the second planar surface is stationary.

[0029] Still another embodiment of the present invention provides such a system wherein the second planar surface is slidable.

[0030] A still further embodiment of the present invention provides such a system wherein at least one sliding assembly comprises a plurality of sliding assemblies.

[0031] Even another embodiment of the present invention provides such a system wherein a reinforcing member connects the plurality of components.

[0032] An even further embodiment of the present invention provides such a system wherein the panel is at least one panel selected from a group of panels consisting of solar panels, work surfaces, covers, hatch covers, access panels, seats, and manhole covers.

[0033] Yet another embodiment of the present invention provides such a system further comprising storage compartments disposed beneath the panel when the panel is in the closed position and revealed when the panel is in the stowed position.

[0034] A yet further embodiment of the present invention provides such a system further comprising storage compartments disposed beneath the panel when the panel is in the closed position and is stowed when the panel is in the stowed position.

[0035] One embodiment of the present invention provides a system for the retraction and deployment of a panel, the system comprising: a first planar surface beneath which is disposed a support structure; a panel selected from a group of panels consisting of solar panels, work surfaces, covers, hatch covers, access panels, seats, manhole covers; an opening disposed in the first planar section which is configured to receive the panel into a closed position disposed in the opening and substantially co-planar with the first planar surface; at least one slider assembly, comprising a stationary component and a sliding component, the stationary component coupled to the support structure and disposed at a sloping angle, the sliding component coupled to the panel at a hinge point such that the panel is rotatable between a co-planar closed position angle and the sloping angle, and when the sliding component is fully extended is slidable on the slider assembly at the sloping angle to a stowed position, at least one panel edge support disposed beneath the first planar surface, such that when the panel is in the closed position, the panel is supported by the panel edge support; and the panel being movable between the stowed position wherein the panel is pitched at a stowed position angle equal to the sloping angle and the closed position by lifting the panel from either position, rotating the panel

to match the angle of the other position, and lowering the panel into the other position.

[0036] The features and advantages described herein are not all-inclusive and, in particular, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification, and claims. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and not to limit the scope of the inventive subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] Fig. 1 is an upper front perspective view of a desk with a sliding lid feature, the lid in the raised position covering a keyboard tray.

[0038] Fig. 2 is an upper front perspective view of the desk of Fig. 1, with the sliding lid retracted below the desktop, exposing the keyboard tray.

[0039] Fig. 3 is a partial cross section view at XX of Fig. 1, illustrating the orientation of the desktop, sliding lid in the raised position covering a stationary keyboard shelf, the lid attached by hinges to a cross member, the cross member attached to respective left and right side drawer sliders which are in turn attached to the sides of the knee space opening in the desk.

[0040] Fig. 4 is a partial cross section view at XX of Fig. 2, illustrating the orientation of the desktop, sliding lid in the retracted position exposing the stationary keyboard shelf.

[0041] Fig. 5 is an upper front perspective view of a desk with a sliding lid feature and a sliding keyboard tray with accessory box, the keyboard tray in the extended position, the lid in the retracted position exposing the accessory box.

[0042] Fig. 6 is a partial front elevation at YY of Fig. 1, illustrating the front edge of the sliding lid in the raised position, attached by hinges to a cross member, the cross member attached to the upper end of respective left and right side drawer sliders.

[0043] Fig. 7 is a partial cross section view of a variation of the embodiment of Figs. 3 and 4, illustrating the orientation of the desktop, sliding lid in the raised position covering a stationary keyboard shelf, the lid attached by hinges to a cross member, the cross member attached to respective left and right side, bottom-mounting drawer sliders which are in turn attached to another cross member attached to the sides of the knee space opening in the desk.

[0044] Fig. 8 is a partial cross section view of a variation of the embodiment of Figs. 3 and 4, illustrating the orientation of the desktop, sliding lid in the retracted position exposing a sliding keyboard shelf and accessory box, the accessory box supported by side rails, the keyboard shelf in the extended position making the accessory box readily accessible.

[0045] Fig. 9 is a partial cross section view of yet another variation of the embodiment of Figs. 3 and 4, illustrating the orientation of the desktop, with the sliding lid in the retracted position exposing a stationary keyboard shelf and a computer monitor arranged at below-desktop level so as to be visible between the desktop and the keyboard shelf.

[0046] Fig. 10 is a partial cross section view of still yet another variation of the embodiment of Figs. 3 and 4, illustrating a drawer slide attached to the side of the knee hole space so as to be rotatable about the lower attach point, with the front or upper end being adjustable over a limited range by use of a screw block and setscrew, with the sliding lid in the retracted position exposing a stationary keyboard shelf.

[0047] Figure 11 is a perspective view drawing illustrating a retractable and deployable panel in a closed position and configured in accordance with one embodiment of the present invention.

[0048] Figure 12 is a perspective view drawing illustrating a retractable and deployable panel in a stowed position and configured in accordance with one embodiment of the present invention.

[0049] Figure 13 is an elevation view drawing illustrating a retractable and deployable panel in a closed position and configured in accordance with one embodiment of the present invention.

[0050] Figure 14 is an elevation view drawing illustrating a retractable and deployable panel in a stowed position and configured in accordance with one embodiment of the present invention.

[0051] Figure 15 is a perspective view drawing illustrating a retractable and deployable panel in a closed position and configured in accordance with another embodiment of the present invention.

[0052] Figure 16 is an elevation view drawing illustrating a retractable and deployable panel in a closed position, having an adjustable sloping angle and configured in accordance with one embodiment of the present invention.

[0053] Figure 17 is an elevation view drawing illustrating a retractable and deployable panel in a partially closed position, providing a stop, and configured in accordance with one embodiment of the present invention.

[0054] Figure 18 is a perspective view drawing illustrating a retractable and deployable panel in a closed position, riding on a single slide assembly and configured in accordance with another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0055] Referring to Figs. 1 and 2, which illustrate one embodiment of the present invention, a desk 10 includes a desktop 20 having an opening that can be conveniently be fitted with a retractable desktop section referred to here as retractable lid 30, as in Fig. 1. Keyboard shelf 80 is recessed below the level of desktop 20 such that retractable lid 30, when extended to a raised position as in Fig. 2, covers it. Keyboard 101, mouse 102, and computer monitor 103, not a part of the invention, are present on keyboard shelf 80 and desktop 20 to illustrate the general purpose to which the invention is directed. While described in relation to desks, one skilled in the art will readily appreciate the applicability of the present invention to various other planar surfaces.

[0056] Referring to Figs. 3 and 4, a sectional view through XX of Figs. 1 and 2, there is shown one embodiment of the retractable lid mechanism of the invention. Retractable lid 30 is secured by hinges 32 to a slave board, here called cross member 34, which is in turn attached to the sliding member 44 of a pair of full-extension linear drawer slides 40. This cross member may be omitted in alternative embodiments and the sliders 40 may be coupled directly to the panel. The base member 42 of each drawer slide 40 is attached to or supported by desk structure at a shallow angle to the horizontal, in one such embodiment, from the desk top brackets or knee space sidewalls, whichever is convenient to the desk configuration.

[0057] The edges or ends of wooden cross member 34 may need to be thicker than is required overall, to provide center section clearance

between fixed and sliding members, and to provide sufficient width of material to match the width and screw hole locations of typical drawer slides 40. Fig. 6, a section through YY of Fig. 1, illustrates a supplemental member 35 glued to each end of cross member 34, providing the necessary thickness for wood screws applied through sliding member 44. Cross member 34 may be fabricated of other than wood, of course, as may other components of the desk.

[0058] Other embodiments may omit cross member 34, relying on the rigidity of lid 30 and good hinge attachment features connecting the lid directly to the sliding component of the slider assemblies in order to maintain proper alignment of the left and right side sliders for smooth extension and retraction. Still other embodiments may incorporate means for limited lateral adjustment as between the slides and the lid, at any of the junctures of the component parts linking the sliders to the lid. Lateral adjustment can be useful for aligning the lid with more precision to the desktop opening.

[0059] Referring to Fig. 7, an alternative to the Figs. 3 and 4 section through XX of Fig. 1, drawer slides 40 may alternatively be oriented flatwise with respect to cross member 34 and likewise to a support board 46, in what would be described as a bottom mounting mode if the cross member were a drawer. In this mounting mode, base members 42 of drawer slides 40 are fixed to the angled support board 46 below them or to an alternative support system such as brackets which might be attached to the underside of desktop 20 or elsewhere to desk structure.

[0060] In use, when lid 30 is extended to a raised position over keyboard shelf 80, as shown in Fig. 3, lid 30 rests on left and right side supports 31, as in Fig. 7, affixed to desktop 20 on each side of the lid opening. The

supports must be configured to permit clearance for extending and retracting lid 30, while providing adequate weight bearing capacity for loads imposed on the section by a user. When the user requires access to keyboard shelf 80, the user pulls lid 30 towards him slightly, to provide a small amount of clearance between lid 30 and the back edge of the lid opening, then lifts the front edge of lid 30 until it is parallel to drawer slides 40, and then allows it to slide downward and backwards into a retracted or stowed position beneath desktop 20.

[0061] The attach point of hinges 32 to the underside of lid 30, is sufficiently forward of the back edge of lid 30, so that the back edge of lid 30 is rotated below and clear of the opening in desktop 20 when lid 30 is rotated parallel to the slides. The back edge of the lid opening in desktop 20 may have a chamfered edge 22, to facilitate lid clearance. Lid 30 follows cross member 34 downwards and backwards on drawer slides 40, assisted by gravity. At the retracted end of the slide travel, the front edge of lid 30 is near the back edge of the lid opening and level with or below the top level of desktop 20, as shown in Fig. 4. At this position, lid 30 rests on stowed position lid supports, omitted here for clarity, or on the chamfered back end of the extended lid position side supports.

[0062] When lid 30 is required by the user to be raised over keyboard shelf 80 for use as a writing or work surface, the user pulls lid 30 forward. Lid 30 and cross member 34 move smoothly until drawer slides 40 reach full extension. Lid 30 then pivots downward on hinges 32 to rest on the side supports, flush or slightly above flush with desktop 20, as explained below.

[0063] The system is, according to one embodiment, configured so that when lid 30 is pulled fully forward to its upper stop and held there while

being rotated to the horizontal, it is slightly above the top surface of the desk. Upon release of lid 30, gravity then pulls the lid retraction assemblage downward, and hence lid 30 slightly back and down until it butts against the back edge of the lid opening and is flush with desktop 20. The weight of the lid retraction assemblage holds lid 30 firmly in this position. This is essentially a self positioning feature of the invention that is both simple to implement and effective in its result.

[0064] The back edge of the lid opening may be configured with a chamfered surface 22 as shown in the figures, to facilitate lid clearance. With materials up to at least three quarters of an inch thick, the pivot point of hinges 32 on lid 30 may be positioned so that lid 20 tilts and clears desktop 20 without any chamfer. When the choice of pivot point results in too little support at the back edge of lid 20, then a support such as a rail or protruding nubs may be added along the back edge of the lid opening. Alternatively, extended lid 30 may be prevented from tipping down at the back under working pressure, by a fixture at the front edge ends of lid 30 that engages with the desktop when lid 30 is extended, and disengages for retraction.

[0065] Ball-bearing drawer slides 40 give lid 30 a smooth and free movement. The system can utilize cheaper alternatives such as the wood or plastic groove type drawer slide assemblies, which are sometimes used as drawer guides, but ball-bearing slides are preferred.

[0066] The dimensions and positioning of the sliding system components must be arranged to suit the thickness of the desktop and the angle at which the slides are mounted. In the various embodiments of the figures, drawer slides 40 are shown mounted at approximately 15 degrees to the horizontal. Other angles between five and 45 degrees may be suitable, depending on

the overall geometry and weight of the elements. Other embodiments may provide sloping angles greater than 45 degrees.

[0067] Referring to Fig. 10, drawer slide 40, and alternatively support board 46 in the case of the flat mount drawer slide of Fig. 7, is pivotally attached at the lower back corner to the desk structure so as to permit a small degree of rotational adjustment of the leading or upper end of drawer slide 40, or support board 46 in the case of Fig. 7. Left and right side threaded blocks 48 are secured to the desk structure. Adjustment screw 49, adjustable from the underside, supports the upper or leading edge of respective sliders 40, or left and right sides of support board 46 of Fig. 7. Adjustment of screws 49 raises or lowers the front end of slide 40 so that the exact alignment of lid 30 to desktop 20 can be obtained at the time of assembly, or readjusted later if necessary.

[0068] It is also within the scope of the invention to incorporate springs or gas cylinders or counterweights in any suitable manner that might expand the working envelope of weights, angles and dimensions of the illustrated embodiments and other obvious variations that operate fundamentally in accordance with the principles of the invention.

[0069] In an alternative embodiment, a pullout tray on slides may replace the stationary keyboard shelf. In this case the desk would offer three modes of use:

- Use of the keyboard from a sitting position close in to the desk and at a comfortable height below the desk top.
- Use of the lid as a writing surface or other purpose without having to move from the typing position.

- Use of the pullout keyboard tray so that the keyboard can be used while the lid is in place over the keyboard recess.

[0070] Fig. 8 is a cross section through XX in Fig. 5. Referring to both Figs. 5 and 8, there is shown in perspective in Fig. 5, desk 10 with lid 30 retracted. A retractable keyboard tray 90, the slides for which are omitted for clarity, is pulled forward to the extended position, giving access to drawer 94, which is attached by bracket 92 to the back side of tray 90, and supported on rails 96 so as to move with tray 90. Drawer 94 is pulled along with tray 90 into the extended position where drawer 94 is exposed for easy accessed via the lid opening in desktop 20, when lid 30 is in the retracted position.

[0071] Drawer 94 may be mounted on slides or on rails 96 as shown, or cantilevered off the back of tray 90, providing tray slides are adequate. Coupling between the tray and the drawer may be by means of a screwed bracket as shown or by other means including methods which permit easy de-coupling such as pegs protruding from the top edges of the drawer and fitting into holes in the tray.

[0072] It will be evident that the space under the desk revealed by the retracted lid 30 and pulled-forward tray 90 may be utilized for alternative purposes. This would comprise a fourth mode of use:

[0073] Use of the pull-out keyboard tray in conjunction with the retracted lid so as to provide access to the drawer or other device configured posterior of the keyboard tray, or to provide an opening through which a monitor or other information display device positioned below the desktop is visible to a user sitting at the keyboard.

[0074] In yet a further important embodiment, Fig. 9 shows an alternate embodiment of a section through XX of Fig. 5, where the drawer of Fig. 8 is omitted, and a monitor 103 or other viewing device is supported by a shelf not shown for clarity, at an angle suitable for viewing by the user as described, when lid 30 is in the retracted position and the keyboard shelf 80 is mounted sufficiently forward or there is a slidable keyboard tray 90 in the extended position.

[0075] Other embodiments of the present invention may be implemented in mobile or stationary flat work surfaces, such as a desktops, kiosks, work stations, library tables, credenzas or kitchen counters with keyboard or laptop computer and/or monitor mounted or otherwise disposed beneath.

[0076] Still further embodiments of the present invention may be used to provide access to storage space below a flat surface on desktops, kiosks, work stations, work benches, plane or boat bulkheads, floors, library tables, conference tables, credenzas, dressing tables, vanities, commodes, benches, seats of chairs, chests, secretaries, occasional tables or kitchen counters.

[0077] Such a configuration may be implemented in situations where it is desirable to move the stowable worktop to reveal or provide access to items below, in situations where moving the worktop surface is advantageous because space limitations prevent a drawer or tray or container from being pulled out. Lifting and pushing in the stowable worktop obviates the need to pull something out, thus working in the reverse way to a traditional drawer.

[0078] Various counters and furnishings could be adapted to implement the various embodiments of the present invention: In a bathroom vanity to give access to makeup kit. Artists' or artisans' or jewelers' bench tops and industrial benches to give access to parts or tools. School furniture, such as workstations or desks for Instructors and students. In vehicles, boats or aircraft to give access to storage or work surfaces or components under the dash, seats or compartment surfaces. To provide a temporary opening in a worktop so that a tray of parts or tray of tools can be placed in the opening, the opening being filled by the stowable worktop when not needed. Store display counters and checkout desks.

[0079] Such an apparatus would be able to provide additional, lower work surfaces thereby enabling wheelchair access, or access to those of short stature as well as standing access to checkout counters and kiosks. In the center of a conference table – a sliding lid provides access to audio-visual equipment when open and provides security when closed, or at least providing camouflage for aesthetically unattractive high technology components. Alternatively it may be positioned around the edge of a conference table, at multiple positions.

[0080] Various embodiments of the present invention may be used in situations where it is beneficial to persons with reduced mobility to be able to use one position for more than one purpose. To provide storage and access to books, documents, maps or drawings. When the stowable top is raised to the slider angle and partially retracted it will serve to support books or documents at a convenient viewing angle. If the stowable top is fully retracted to be below the fixed top then the edge of the fixed top may be similarly used.

[0081] The front edge of a moveable section of worktop can be raised to an angle such that it can be moved backwards and below an adjacent worktop. Slider assemblies are mounted below the adjacent worktop at an angle to it and hingedly connected to the rear edge of the moveable worktop. The moveable section worktop is thus constrained to move with the sliders when pivoted at the hinges so as to be parallel with the sliders. The slider assemblies may be drawer slides or pocket door slides or any similar linear sliding devices that facilitate smooth movement of the moveable worktop. The moveable worktop, when parallel to the sliders, can be moved below the adjacent worktop to reveal or provide access to the area below, it can alternatively be moved forwards and upwards and pivoted down at the hinges so that it returns to being flush with the adjacent worktop and provides a surface continuous with it.

[0082] Figures 11 and 12 show the top part of a structure with a fixed top 20 and a stowable top section 30 that can conveniently be retracted below the fixed top 20 to expose or provide access to the area below. The structure and tops may comprise, but are not limited to, desktops, kiosks, work stations, work benches, plane or boat bulkheads, accessory panels on boats and planes, floors, library tables, conference tables, credenzas, dressing tables, vanities, commodes, benches, seats of chairs, chests, secretaries, occasional tables or kitchen counters or any horizontal or vertical, planar surface in which a stowable work surface is desired. One skilled in the art will readily appreciate that the present invention may also be implemented in manhole covers, access panels, hatch covers, and trap doors. To illustrate the general purpose to which the invention is directed a tray or shelf, 80, is shown to be visible and accessible when the stowable top is retracted. When the stowable top is in the raised position as in FIG 11 it is available for use as a desktop, countertop, bearing surface or simply to cover or conceal the area below it. When the stowable top is

retracted the area below it is accessible for a variety of uses. The shelf is representative of the alternative facilities mentioned above.

[0083] Referring to FIGs 13 & 14, a sectional view through XX of FIGs 11 & 12, there is shown one embodiment of the stowable top mechanism. Stowable top 30 is fixed by hinges to the sliding members of a pair of linear sliders 40, by means of rivets, screws, welding or other good attachment methods. The base member, 42, of each slider is attached to or supported by the fixed top or support structure at a shallow angle to the top by any means convenient to the structure configuration. It should be noted that with many types of slider assembly, including ball bearing drawer slides, either member may be designated and used as either the base member or the moving member. A slide mounting angle of 15 degrees is typical but angles of less than 10 degrees and up to 45 degrees have been used successfully. With tops made of thin material very small mounting angles will allow the stowable top to move below the fixed top. Large angles, even up to 90 degrees, reduce the distance that the stowable top intrudes below the fixed top and also reduce the front-to-back dimension required for the fixed top to cover the sliders.

[0084] The front edge of fixed top 20 is chamfered to provide clearance for the stowable top. This chamfer may not be necessary depending upon the slider angle, the positioning of hinges 32, and the thickness of top 20.

[0085] A cross piece, 46, is fixed to the moving members of left and right sliders and serves to constrain the sliders to move in unison, thus enhancing the linearity of movement of the stowable top.

[0086] The slider assemblies, 40, may be drawer slides or pocket door slides or any slides consisting of fixed and moving parts, which facilitate
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smooth movement of the stowable top, they may be standard commercial slides or specially manufactured or modified slides. Typically they may be full-extension ball bearing drawer slides. The system can use cheaper alternatives such as wood, metal or plastic groove type or roller type slide assemblies which are sometimes used as drawer guides.

[0087] The hinges, 32, may be simple butt hinges or any other type of hinge that permits the stowable top, 30, to be pivoted until parallel to the slider assemblies 40. Some types of hinges with complex hinging characteristics, e.g. cup hinges also known as European hinges, may provide increased clearance below the fixed top when the stowable top is raised to the slider angle. One skilled in the art will appreciate that other hinges may be used.

[0088] The hinges may be attached to the sliders by rivets, screws, welding or other good attachment methods. Alternatively the hinges and sliders may be indirectly connected together by means of an intermediate plate or board or bracket etc. If the intermediate piece also joins the moving members of both left and right sliders then it can replace the cross piece 46. Sliders that are manufactured with hinges incorporated may also be used.

[0089] Also shown are right and left side supports, 31, which the stowable top rests on when in the closed position.

[0090] According to some embodiments of the present invention a front apron can be attached to the structure or to the shelf, 80, or to the front edge of the stowable top, 30, so that the area under the top is obscured from a front view or so as to facilitate storage below the top. Such apron may be hinged to the shelf or to the stowable top. Such apron may be

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lockable to the stowable top and to the support structure to provide security for the area below the top.

[0091] FIG 15 shows a simple stand-alone desk or work unit etc. in which the stowable top is not bordered at the sides by a fixed top. This embodiment simplifies construction by obviating the need to make a top with an opening to accommodate the stowable top.

[0092] The invention may be incorporated into structures made of wood, plastic, metal, composites or any materials used for worktops. Plastic and metal tops offer the advantage that they are often thinner than wood or composite tops so that shallower slider angles may be used and chamfering of the edge of the fixed top may be unnecessary.

[0093] FIG 16 shows flat-mounted slides fixed to a support board 46 which is pivotally attached at the lower back corners to the desk structure so as to permit a small degree of rotational adjustment of the leading end of the support board and thus of the leading ends of the slides. The rotational adjustment is obtained by use of screw blocks 48 and set screws 49, other means may be used to adjust the height of the leading ends of the sliders. The slides may alternatively be orientated edgewise and fixed to the edges of the support board 46. The height adjusters provide the self-positioning feature described above. With close manufacturing tolerances the height adjusters may be omitted.

[0094] If the sliders are not mounted on a common support board, 46, then the upper end of the fixed member of each slider may be supported on a height adjuster, the lower end of each fixed member being pivotally attached to the structure. Height adjusters may be used with flat-mounted or edge-mounted sliders.

[0095] The slider assemblies may be supported from the fixed top or the support structure. They may be fixed to a support board, which is in turn fixed to the top or support structure. Fixture may be by means of separate brackets or boards or it may be by means of a specially manufactured bracket or holder which holds the sliders and which is convenient for fixing to either the top or the support structure. The manufactured holder or bracket may incorporate height adjusters as described above and a cross piece 46.

[0096] FIG 17 shows one simple method by which the stowable top may be supported in a partially retracted position. A hole in the stowable top support, 31, allows for a peg, 33, to be pushed through it so as to lodge in a blind hole, 35, in the underside of the stowable top.

[0097] Figure 18 illustrates one embodiment of the present invention where a single slide assembly is provided. The slide assembly 44,42 is located in the center of the panel.

[0098] Alternative embodiments of the present invention may provide for the stowable top to be mounted in an upright or vertical wall or panel, such as a bulkhead of a ship, yacht, boat, or plane. Such a configuration would provide the boater, pilot or passenger with stowable work surfaces that when not in use could be stowed in the wall or bulkhead. Locks or stops could be incorporated into this embodiment to prevent the motion of the boat or plane from deploying or stowing the surface when not desired by the user.

[0099] In one embodiment of the present invention, the sliding surface can be incorporated into a movable article of furniture, like a typewriter stand or computer cart. The stowable top could be used as a means of securing or protecting laptop computers, keyboards, or typewriters, from dust and other pollutants and, if a locking mechanism is provided, from theft.

[00100]Alternatively, such stowable panel could be integrated into a non-furniture planar surface, such as instrument panels, floors, roads, sidewalks, streets or other load-bearing surfaces. A retractable and deployable panel in such a surface could provide access to space beneath the surface such as a crawl space, manhole, sewer, root cellar, or basement, thereby allowing access to electronics, storage, heating, cooling, mechanical equipment or utilities. To insure that such high weight applications would have adequate support to prevent collapse of the panel, a plurality of panel edge supports may be disposed around the opening. Indeed, with the exception of opposing gaps to facilitate passing the panel edgewise through the opening, the panel supports may be continuous lips around the edge of the opening. In an alternative embodiment, latches or locks may be provided which would reinforce and secure the panel. In contrast to traditional covers used in such applications, the panel is controlled thereby preventing injury to the operators or others. In one such embodiment it could be locked to provide secure, discrete storage. In another embodiment of the present invention the panel may be situated in the seat of a chair or bench, thereby providing a means of access to a storage space disposed within the base of the chair or bench. In such applications, panel system is scalable, being readily applied to small or extremely large openings.

[00101]Still other embodiments may be in commercial furniture like kiosks or check out stands. The top can be used as a writing or work surface for

standing patrons, but can be stowed to provide access to a lower writing or work surface for patrons in wheel chairs, children, and those of short stature.

[00102]Referring to Fig. 13, in some embodiments, the retracting mechanism is biased for positive retracting force by gravity, providing both stable extension and facile retraction. In other embodiments, for instance, mobile installations, the retraction mechanisms may incorporate springs, gas cylinders or other biasing or retracting force providing mechanisms to assure stability of the extended panel and facile retraction of the panel when necessary.

[00103]One embodiment of the present invention provides a system for the retraction and deployment of a panel, that system comprising: a first planar surface beneath which is disposed a support structure; a panel; and an opening disposed in the first planar section which is configured to receive the panel into a closed position disposed in the opening and substantially co-planar with the first planar surface. Also provided is at least one slider assembly, comprising a stationary component and a sliding component, the stationary component coupled to the support structure and disposed at a sloping angle, the sliding component coupled to the panel at a hinge point, which may be a hinge or the functional equivalent, that provides flex or rotational coupling between the panel and the sliding assembly such that the panel is rotatory between a co-planar closed position angle and the sloping angle. The sliding component may comprise either a single sliding member or a plurality of telescoping sliding members. A connecting bar may in some embodiments be disposed between the hinges and the sliders, while in others the sliders may be directly coupled to the hinge. The hinge may be unitary or be a plurality of hinges. When the sliding component is fully extended the panel is slidable on the slider assembly at the sloping

angle to a stowed position, the hinge point may be higher than the plane of the planar surface when the slider assembly is extended to the upper limit. According to this embodiment the panel is movable between the stowed position wherein the panel is pitched at a stowed position angle equal to the sloping angle and the closed position by lifting the panel from either position, rotating the panel to match the angle of the other position, and lowering the panel into the other position. The system may also comprise at least one panel edge support disposed beneath the first planar surface, such that when the panel is in the closed position, the panel is supported by the panel edge support which may be a lip disposed around the edge of the opening or comprise a plurality of panel edge supports, or comprises first and second oppositely disposed supports separated by first and second gaps disposed proximate to the hinge point.

[00104] Yet another embodiment of the present invention provides such a system wherein the opening is a geometric shape chosen from the group of geometric shapes consisting of squares, oblongs, triangles, ovals, and circles. The shape of the opening dictates the shape of the panel, and may vary depending on the application. Similarly, the opening may be bounded by the first planar surface on three sides or alternatively on all sides.

[00105] Even another embodiment of the present invention provides such a system wherein the front edge of the panel and the front edge of the opening have mating profiles, these mating profiles may be at an angle equal to the sloping angle so as to facilitate the edgewise passage of the panel through the opening.

[00106] Another embodiment of the present invention provides such a system further comprising a support member to which one central

stationary component is attached, the support member being attached at a sloping angle to the support structure.

[00107]A further embodiment of the present invention provides such a system wherein a first end of the stationary component is pivotally attached to the support structure, a second end of the stationary component bearing on at least one adjustable support attached to the support structure, the adjustable support having means for adjusting the sloping angle of the stationary components.

[00108]Still another embodiment of the present invention provides such a system wherein the first planar surface comprises a planar surface selected from the group of planar surfaces consisting of desktops, kiosks, work stations, work benches, plane or boat bulkheads, floors, library tables, conference tables, credenzas, dressing tables, vanities, commodes, benches, seats of chairs, chests, secretaries, occasional tables, kitchen counters, hatches, floors, roads, sidewalks, pavement, and lawns.

[00109]A still further embodiment of the present invention provides such a system further comprising a second planar surface parallel to the first planar surface and disposed beneath the panel. In this way, the second planar surface may be retracted and deployed with the panel, and may provide stowed storage space. This second surface may be stationary with respect to the panel or may be slidable.

[00110]Another embodiment of the present invention provides such a system further comprising a second planar surface parallel to the first planar surface and disposed beneath the opening. In this way the second

surface is revealed when the panel is stowed and may be stationary or slidable.

[00111]A still further embodiment of the present invention provides such a system wherein at least one sliding assembly comprises a plurality of sliding assemblies. Such an embodiment may include variations where the slider assembly is disposed on opposing sides of the panel, embodiments where sliders are disposed on the interior underside of the panel, or embodiments where slider assemblies are mounted both on the opposing sides of the panel and on the interior underside of the panel.

[00112]Even another embodiment of the present invention provides such a system wherein a reinforcing member connects the plurality of sliding members.

[00113]An even further embodiment of the present invention provides such a system wherein the panel is at least one panel selected from a group of panels consisting of solar panels, work surfaces, covers, hatch covers, access panels, seats, and manhole covers. Any electrical connections required may be made using wire and or other suitable connectors and would be within the scope of one skilled in the art.

[00114]Yet another embodiment of the present invention provides such a system further comprising storage compartments disposed beneath the panel when the panel is in the closed position and either revealed or stowed when the panel is in the stowed position.

[00115]The foregoing description of the embodiments of the invention has been presented for the purposes of illustration and description. It is not

intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of this disclosure. It is intended that the scope of the invention be limited not by this detailed description, but rather by the claims appended hereto.